



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:49 PM UTC

PDB ID : 3Q36 / pdb_00003q36
Title : Crystal structure of the 4Fe-4S cluster domain of human DNA primase large subunit
Authors : Agarkar, V.B.; Babayeva, N.D.; Tahirov, T.H.
Deposited on : 2010-12-21
Resolution : 2.50 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

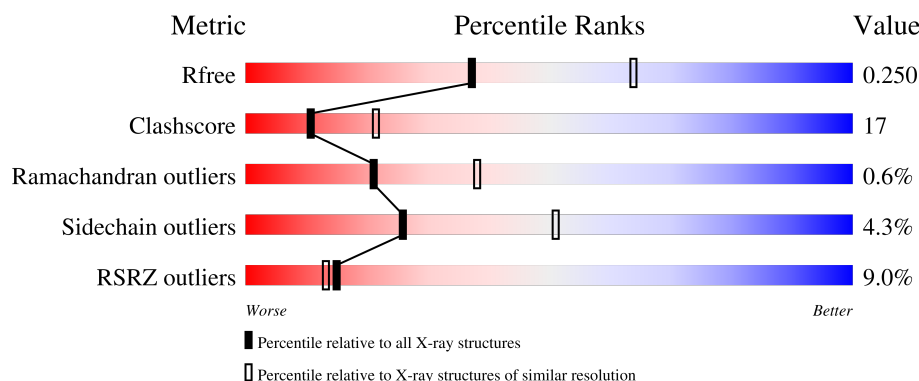
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	192	6% 57% 32% • 7%
1	B	192	10% 56% 34% • 7%

2 Entry composition [i](#)

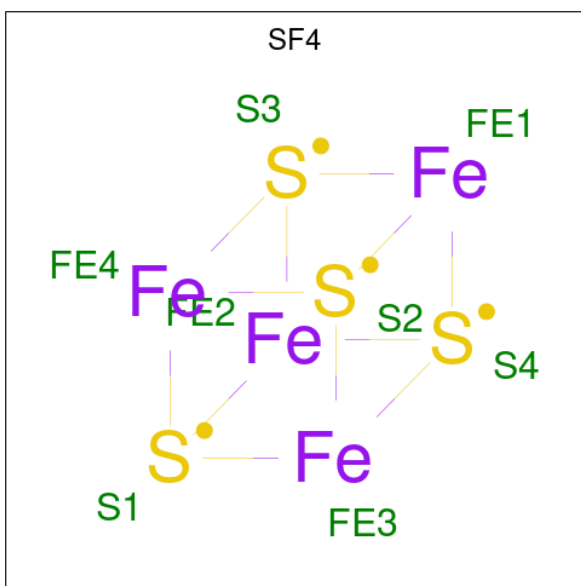
There are 4 unique types of molecules in this entry. The entry contains 2944 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called DNA primase large subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	178	Total	C	N	O	S	0	0	0
			1451	931	254	256	10			
1	B	178	Total	C	N	O	S	0	0	0
			1455	933	254	258	10			

- Molecule 2 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	Fe	S	0	0
			8	4	4		
2	B	1	Total	Fe	S	0	0
			8	4	4		

- Molecule 3 is FE (III) ION (CCD ID: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total 1	Fe 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	14	Total 14	O 14	0	0
4	B	7	Total 7	O 7	0	0

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Chain A:
-
- Sequence logo for Chain A. The y-axis represents information content in bits. The x-axis lists amino acids. A color scale at the top indicates conservation levels: 6% (red), 57% (green), 32% (yellow), and 7% (grey).
- | Position | Amino Acid | Information Content (bits) |
|----------|------------|----------------------------|
| 1 | D135 | 0.15 |
| 2 | D136 | 0.10 |
| 3 | C437 | 0.10 |
| 4 | G438 | 0.15 |
| 5 | F439 | 0.10 |
| 6 | S440 | 0.10 |
| 7 | L441 | 0.10 |
| 8 | M442 | 0.10 |
| 9 | H443 | 0.10 |
| 10 | Q446 | 0.10 |
| 11 | E450 | 0.10 |
| 12 | L455 | 0.10 |
| 13 | ASN | 0.10 |
| 14 | GLY | 0.10 |
| 15 | T349 | 0.15 |
| 16 | R350 | 0.10 |
| 17 | H351 | 0.10 |
| 18 | S352 | 0.10 |
| 19 | F353 | 0.10 |
| 20 | G354 | 0.10 |
| 21 | LVS | 0.10 |
| 22 | GLU | 0.10 |
| 23 | GLY | 0.10 |
| 24 | GLY | 0.10 |
| 25 | ARG | 0.10 |
| 26 | THR | 0.10 |
| 27 | ASP | 0.10 |
| 28 | Y362 | 0.10 |
| 29 | F365 | 0.10 |
| 30 | K369 | 0.10 |
| 31 | L372 | 0.10 |
| 32 | S377 | 0.10 |
| 33 | Q378 | 0.10 |
| 34 | G379 | 0.10 |
| 35 | D380 | 0.10 |
| 36 | R387 | 0.10 |
| 37 | H388 | 0.10 |
| 38 | S389 | 0.10 |
| 39 | D390 | 0.10 |
| 40 | F391 | 0.10 |
| 41 | E392 | 0.10 |
| 42 | L393 | 0.10 |
| 43 | L394 | 0.10 |
| 44 | K395 | 0.10 |
| 45 | Q396 | 0.10 |
| 46 | G407 | 0.10 |
| 47 | Q410 | 0.10 |
| 48 | L411 | 0.10 |
| 49 | L412 | 0.10 |
| 50 | D413 | 0.10 |
| 51 | L414 | 0.10 |
| 52 | G417 | 0.10 |
| 53 | T418 | 0.10 |
| 54 | H419 | 0.10 |
| 55 | Y420 | 0.10 |
| 56 | Q421 | 0.10 |
| 57 | V422 | 0.10 |
| 58 | A423 | 0.10 |
| 59 | Q424 | 0.10 |
| 60 | Q425 | 0.10 |
| 61 | K340 | 0.10 |
| 62 | F341 | 0.10 |

- Chain B:
-
- 10% 56% 34% 7%
- GLY ASN VAL GLY LYS L271 L272 L273 L274 L275 L276 L280 L281 L284 L285 L288 L289 L290 L295 L296 L297 L298 L299 L300 L301 L302 L303 L307 L308 L311 L312 L313 L316 L317 L320 L324 L327 L328 L329 L330 L333 L336 L337 L340 L341 L342 L343
- G544 Y345 S346 Y347 N348 L349 R350 F353 G354 L355 G356 L357 L358 L359 L360 L361 L362 L363 L364 L365 L369 L370 L371 G379 G384 P385 F386 R387 H388 P391 F392 L393 K397 G406 S409 Q410 D413 L414 T418 H419 Y420 Q421 V422 A423 K426 E429 L430
- V434 D435 D436 C437 G438 F439 H443 P444 N445 Q446 F447 E450 S451 Q452 R453 L454 L455 ASN GLY

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	126.48Å 83.72Å 47.56Å 90.00° 97.65° 90.00°	Depositor
Resolution (Å)	31.16 – 2.50 31.16 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.1 (31.16-2.50) 97.1 (31.16-2.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	109.95 (at 2.51Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.228 , 0.250 0.225 , 0.250	Depositor DCC
R_{free} test set	824 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å ²)	37.2	Xtriage
Anisotropy	0.104	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 53.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	2944	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.52% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FE, SF4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.55	0/1491	1.05	11/2004 (0.5%)
1	B	0.54	1/1495 (0.1%)	1.02	6/2010 (0.3%)
All	All	0.54	1/2986 (0.0%)	1.04	17/4014 (0.4%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	307	MET	SD-CE	5.44	1.93	1.79

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	333	LYS	N-CA-C	-7.24	104.42	113.18
1	A	388	HIS	N-CA-C	6.69	121.73	113.50
1	A	306	ARG	N-CA-C	-6.56	104.21	111.36
1	A	349	ILE	N-CA-C	-6.47	104.34	110.42
1	A	423	ALA	N-CA-C	-5.86	104.89	111.28
1	A	372	LEU	N-CA-C	5.72	120.32	113.23
1	B	384	CYS	CA-C-N	5.67	125.14	119.24
1	B	384	CYS	C-N-CA	5.67	125.14	119.24
1	A	283	SER	N-CA-C	5.61	121.02	113.72
1	B	388	HIS	N-CA-C	5.61	120.25	112.90
1	A	390	ASP	CA-C-N	5.39	126.57	119.84
1	A	390	ASP	C-N-CA	5.39	126.57	119.84
1	A	314	LYS	N-CA-C	-5.22	105.48	111.07
1	A	441	LEU	N-CA-C	5.21	117.98	110.28
1	B	365	PHE	N-CA-C	5.16	117.79	110.10
1	B	296	ARG	N-CA-C	5.10	116.92	111.36
1	A	317	GLY	N-CA-C	5.01	122.73	115.32

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1451	0	1421	46	0
1	B	1455	0	1422	51	0
2	A	8	0	0	0	0
2	B	8	0	0	0	0
3	B	1	0	0	0	0
4	A	14	0	0	0	0
4	B	7	0	0	0	0
All	All	2944	0	2843	96	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 17.

All (96) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:439:PHE:CD2	1:B:450:GLU:HG2	2.05	0.91
1:A:329:GLN:HE21	1:A:333:LYS:HE3	1.44	0.82
1:B:336:MET:HE1	1:B:345:TYR:HE2	1.45	0.82
1:B:452:GLN:O	1:B:455:LEU:HG	1.80	0.81
1:B:437:CYS:HB2	1:B:439:PHE:CE2	2.19	0.76
1:A:288:MET:HE3	1:A:312:PHE:HB2	1.68	0.74
1:B:439:PHE:CE2	1:B:450:GLU:HG2	2.23	0.73
1:A:272:SER:HB3	1:A:275:GLN:CD	2.13	0.73
1:A:418:THR:HG22	1:A:418:THR:O	1.87	0.72
1:B:337:ASP:HB3	1:B:340:LYS:HB2	1.72	0.70
1:A:446:GLN:O	1:A:450:GLU:HG2	1.94	0.67
1:A:410:GLN:NE2	1:A:426:LYS:HE3	2.10	0.67
1:A:426:LYS:HG3	1:A:430:MET:HE2	1.78	0.66
1:A:407:GLY:HA3	1:A:430:MET:SD	2.36	0.65
1:B:342:ASP:HA	1:B:346:SER:HB3	1.80	0.64
1:A:329:GLN:NE2	1:A:333:LYS:HE3	2.13	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:443:HIS:HE1	1:B:445:ASN:OD1	1.82	0.63
1:A:392:GLU:O	1:A:396:GLN:HG3	1.99	0.62
1:B:328:LYS:HG3	1:B:341:PHE:CD2	2.35	0.62
1:A:417:GLY:O	1:A:418:THR:HB	1.99	0.61
1:A:410:GLN:CD	1:A:426:LYS:HE3	2.26	0.61
1:B:313:LEU:O	1:B:316:ILE:HG12	2.02	0.59
1:B:337:ASP:HB3	1:B:340:LYS:CB	2.33	0.59
1:B:303:HIS:CE1	1:B:307:MET:HE3	2.38	0.58
1:B:295:LEU:HG	1:B:330:GLU:HG2	1.84	0.58
1:A:307:MET:HA	1:A:307:MET:HE3	1.83	0.58
1:A:418:THR:HG23	1:A:420:TYR:CE2	2.39	0.57
1:B:393:LEU:HD21	1:B:397:LYS:HZ1	1.69	0.57
1:A:414:LEU:HD13	1:A:422:VAL:HG12	1.85	0.57
1:A:390:ASP:OD1	1:A:393:LEU:HD12	2.06	0.56
1:A:395:LYS:HG3	1:A:412:LEU:HD11	1.89	0.55
1:A:320:LEU:HD11	1:A:350:ARG:HA	1.88	0.55
1:A:273:LEU:HD12	1:A:276:ILE:HD11	1.88	0.54
1:B:297:GLU:C	1:B:298:ASN:HD22	2.16	0.54
1:B:324:LEU:O	1:B:328:LYS:HB2	2.08	0.54
1:B:346:SER:O	1:B:350:ARG:HG3	2.08	0.53
1:B:429:GLU:OE2	1:B:436:ASP:HA	2.08	0.53
1:A:442:ASN:HD22	1:A:442:ASN:C	2.16	0.52
1:A:437:CYS:HB2	1:A:439:PHE:CE2	2.43	0.52
1:B:450:GLU:OE2	1:B:453:ARG:NH1	2.43	0.52
1:B:336:MET:HE1	1:B:345:TYR:CE2	2.36	0.51
1:B:290:GLN:OE1	1:B:397:LYS:HE2	2.10	0.51
1:B:365:PHE:CE1	1:B:369:LYS:HE3	2.45	0.51
1:A:336:MET:HG3	1:A:340:LYS:HD3	1.91	0.51
1:A:286:PRO:HD3	1:A:427:TYR:CE1	2.47	0.50
1:B:418:THR:HG23	1:B:418:THR:O	2.09	0.50
1:A:418:THR:O	1:A:418:THR:CG2	2.57	0.49
1:B:298:ASN:HD22	1:B:298:ASN:N	2.09	0.48
1:B:420:TYR:O	1:B:423:ALA:HB3	2.13	0.48
1:A:421:GLN:O	1:A:425:GLN:HG3	2.14	0.47
1:A:328:LYS:HB2	1:A:341:PHE:CE2	2.50	0.47
1:B:288:MET:HE1	1:B:308:GLN:HG2	1.97	0.47
1:A:295:LEU:HG	1:A:330:GLU:HG2	1.97	0.47
1:B:444:PRO:O	1:B:447:PHE:HB3	2.15	0.47
1:B:429:GLU:HB3	1:B:434:VAL:O	2.15	0.47
1:B:320:LEU:HD11	1:B:350:ARG:HA	1.97	0.46
1:A:272:SER:HB3	1:A:275:GLN:NE2	2.31	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:406:GLY:O	1:B:409:SER:HB3	2.15	0.46
1:B:410:GLN:O	1:B:413:ASP:HB2	2.16	0.45
1:B:285:PRO:HB3	1:B:447:PHE:CD1	2.51	0.45
1:B:434:VAL:O	1:B:434:VAL:HG23	2.15	0.45
1:A:332:ILE:C	1:A:334:GLY:N	2.73	0.45
1:B:342:ASP:HA	1:B:346:SER:CB	2.45	0.45
1:A:332:ILE:C	1:A:334:GLY:H	2.25	0.45
1:B:365:PHE:CG	1:B:369:LYS:HD3	2.52	0.45
1:A:314:LYS:NZ	1:A:362:TYR:O	2.48	0.44
1:B:418:THR:O	1:B:418:THR:CG2	2.66	0.44
1:A:435:ASP:OD2	1:B:426:LYS:NZ	2.45	0.44
1:B:371:ILE:HG23	1:B:387:ARG:HG2	2.00	0.43
1:A:417:GLY:O	1:A:418:THR:CB	2.66	0.43
1:A:311:LEU:HD12	1:A:365:PHE:CE1	2.54	0.43
1:A:272:SER:CB	1:A:275:GLN:CD	2.86	0.43
1:B:347:TYR:O	1:B:350:ARG:HB2	2.19	0.43
1:A:328:LYS:HG3	1:A:341:PHE:CD2	2.54	0.43
1:B:298:ASN:N	1:B:298:ASN:ND2	2.65	0.43
1:B:327:TRP:O	1:B:328:LYS:C	2.62	0.42
1:A:291:LEU:HD13	1:A:309:TYR:HB2	2.01	0.42
1:A:336:MET:CG	1:A:340:LYS:HD3	2.50	0.42
1:A:443:HIS:O	1:A:446:GLN:HB3	2.19	0.42
1:B:414:LEU:HD13	1:B:422:VAL:HG12	2.02	0.42
1:B:280:SER:HA	1:B:284:PHE:CG	2.55	0.42
1:B:350:ARG:HH11	1:B:350:ARG:HG2	1.85	0.42
1:A:272:SER:HB3	1:A:275:GLN:CG	2.50	0.41
1:B:311:LEU:HB3	1:B:364:PRO:HA	2.02	0.41
1:A:425:GLN:O	1:A:428:PHE:HB3	2.20	0.41
1:B:384:CYS:HA	1:B:385:PRO:HD3	1.90	0.41
1:B:300:HIS:CG	1:B:301:LEU:N	2.89	0.41
1:B:443:HIS:CE1	1:B:445:ASN:OD1	2.69	0.41
1:A:390:ASP:OD1	1:A:393:LEU:CD1	2.69	0.41
1:B:302:ARG:HH12	1:B:379:GLY:HA3	1.86	0.40
1:A:377:SER:O	1:A:380:ASP:HB2	2.22	0.40
1:B:363:THR:O	1:B:364:PRO:C	2.65	0.40
1:A:288:MET:CE	1:A:312:PHE:HB2	2.46	0.40
1:A:365:PHE:CZ	1:A:369:LYS:HE2	2.57	0.40
1:A:442:ASN:C	1:A:442:ASN:ND2	2.78	0.40
1:B:311:LEU:HD12	1:B:365:PHE:CE1	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	174/192 (91%)	164 (94%)	9 (5%)	1 (1%)	21	38
1	B	174/192 (91%)	159 (91%)	14 (8%)	1 (1%)	21	38
All	All	348/384 (91%)	323 (93%)	23 (7%)	2 (1%)	21	38

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	276	ILE
1	A	346	SER

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	161/171 (94%)	151 (94%)	10 (6%)	16	34
1	B	162/171 (95%)	158 (98%)	4 (2%)	42	69
All	All	323/342 (94%)	309 (96%)	14 (4%)	26	51

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	290	GLN
1	A	302	ARG
1	A	307	MET
1	A	339	ASP

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Mol	Chain	Res	Type
1	A	349	ILE
1	A	378	GLN
1	A	387	ARG
1	A	395	LYS
1	A	435	ASP
1	A	442	ASN
1	B	273	LEU
1	B	391	PRO
1	B	418	THR
1	B	426	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	275	GLN
1	A	290	GLN
1	A	298	ASN
1	A	329	GLN
1	A	351	HIS
1	A	399	GLN
1	A	442	ASN
1	A	452	GLN
1	B	275	GLN
1	B	298	ASN
1	B	329	GLN
1	B	396	GLN
1	B	399	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	SF4	B	458	1	0,12,12	-	-	-		
2	SF4	A	458	1	0,12,12	-	-	-		

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SF4	B	458	1	-	-	0/6/5/5
2	SF4	A	458	1	-	-	0/6/5/5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	178/192 (92%)	0.59	12 (6%) 24 21	17, 40, 67, 76	0
1	B	178/192 (92%)	0.73	20 (11%) 10 8	23, 44, 74, 83	0
All	All	356/384 (92%)	0.66	32 (8%) 15 13	17, 43, 71, 83	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	344	GLY	6.1
1	B	361	ASP	4.4
1	A	438	GLY	3.9
1	B	362	TYR	3.3
1	A	354	GLY	3.3
1	A	271	ILE	2.7
1	B	455	LEU	2.7
1	B	280	SER	2.7
1	A	362	TYR	2.6
1	B	393	LEU	2.6
1	B	363	THR	2.6
1	B	340	LYS	2.6
1	A	352	SER	2.6
1	B	317	GLY	2.5
1	B	281	THR	2.4
1	B	433	ASN	2.4
1	B	343	LYS	2.4
1	B	341	PHE	2.3
1	A	272	SER	2.3
1	B	272	SER	2.3
1	A	435	ASP	2.3
1	A	275	GLN	2.2
1	B	413	ASP	2.2
1	A	321	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	280	SER	2.2
1	B	342	ASP	2.2
1	B	275	GLN	2.1
1	B	271	ILE	2.1
1	B	349	ILE	2.1
1	B	344	GLY	2.1
1	A	350	ARG	2.1
1	B	348	ASN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SF4	A	458	8/8	0.96	0.05	18,22,25,26	0
2	SF4	B	458	8/8	0.97	0.06	28,29,31,32	0
3	FE	B	1	1/1	0.97	0.13	51,51,51,51	0

6.5 Other polymers [i](#)

There are no such residues in this entry.